

# MATHEMATICS A

Thursday, January 26, 2006 — 1:15 to 4:15 p.m., only

Print Your Name:

Print Your School's Name:

Print your name and the name of your school in the boxes above. Then turn to the last page of this booklet, which is the answer sheet for Part I. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. Any work done on this sheet of scrap graph paper will *not* be scored. All work should be written in pen, except graphs and drawings, which should be done in pencil.

This examination has four parts, with a total of 39 questions. You must answer all questions in this examination. Write your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in Parts II, III, and IV directly in this booklet. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice . . .

A minimum of a scientific calculator, a straightedge (ruler), and a compass must be available for you to use while taking this examination.

The use of any communications device is strictly prohibited when taking this examination. If you use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**



4 Which expression represents “5 less than the product of 7 and  $x$ ”?

- (1)  $7(x - 5)$                       (3)  $7 + x - 5$   
(2)  $7x - 5$                         (4)  $5 - 7x$

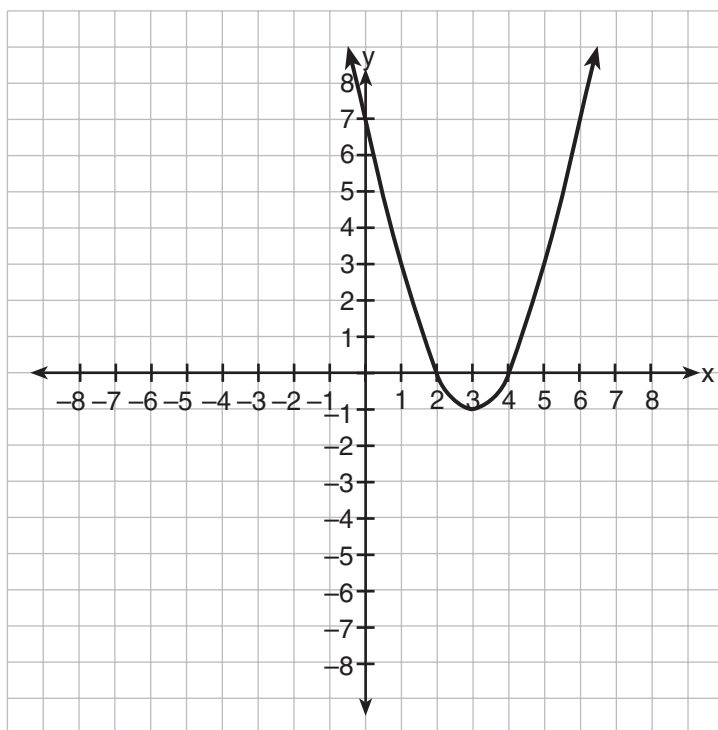
**Use this space for  
computations.**

5 What is the  $y$ -intercept of the graph of the line whose equation is

$$y = -\frac{2}{5}x + 4?$$

- (1)  $-\frac{5}{2}$                                 (3) 0  
(2)  $-\frac{2}{5}$                                 (4) 4

6 Which is an equation of the line of symmetry for the parabola in the accompanying diagram?



- (1)  $x = 2$                                 (3)  $x = 3$   
(2)  $x = 4$                                 (4)  $y = 3$





**Use this space for  
computations.**

**14** The image of point  $(-2,3)$  under translation  $T$  is  $(3,-1)$ . What is the image of point  $(4,2)$  under the same translation?

- (1)  $(-1,6)$                       (3)  $(5,4)$   
(2)  $(0,7)$                         (4)  $(9,-2)$

**15** A builder is building a rectangular deck with dimensions of 16 feet by 30 feet. To ensure that the sides form  $90^\circ$  angles, what should each diagonal measure?

- (1) 16 ft                              (3) 34 ft  
(2) 30 ft                              (4) 46 ft

**16** Which statement is the inverse of “If the waves are small, I do not go surfing”?

- (1) If the waves are not small, I do not go surfing.  
(2) If I do not go surfing, the waves are small.  
(3) If I go surfing, the waves are not small.  
(4) If the waves are not small, I go surfing.

**17** A dog is tied with a rope to a stake in the ground. The length of the rope is 5 yards. What is the area, in square yards, in which the dog can roam?

- (1)  $25\pi$                               (3) 25  
(2)  $10\pi$                               (4) 20

**18** Melissa’s test scores are 75, 83, and 75. Which statement is true about this set of data?

- (1) mean  $<$  mode                      (3) mode = median  
(2) mode  $<$  median                    (4) mean = median

19 When  $3a^2 - 7a + 6$  is subtracted from  $4a^2 - 3a + 4$ , the result is

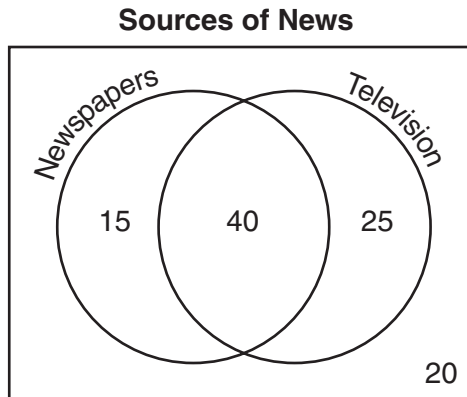
- (1)  $a^2 + 4a - 2$                       (3)  $-a^2 - 4a + 2$   
(2)  $a^2 - 10a - 2$                       (4)  $7a^2 - 10a + 10$

Use this space for computations.

20 In the equation  $A = p + prt$ ,  $t$  is equivalent to

- (1)  $\frac{A - pr}{p}$                                   (3)  $\frac{A}{pr} - p$   
(2)  $\frac{A - p}{pr}$                                   (4)  $\frac{A}{p} - pr$

21 The accompanying Venn diagram shows the results of a survey asking 100 people if they get news by reading newspapers or by watching television.



What is the probability that a person selected at random from this survey does *not* claim television as a source of getting the news?

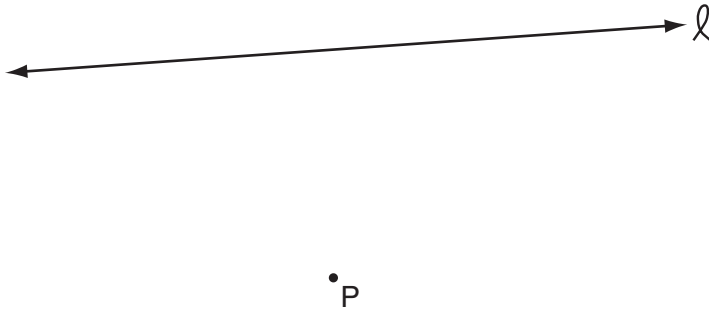
- (1)  $\frac{15}{100}$                                       (3)  $\frac{55}{100}$   
(2)  $\frac{35}{100}$                                       (4)  $\frac{75}{100}$

22 The expression  $\frac{6\sqrt{20}}{3\sqrt{5}}$  is equivalent to

- (1)  $3\sqrt{15}$                                   (3) 8  
(2)  $2\sqrt{15}$                                   (4) 4

23 In the accompanying diagram, point  $P$  lies 3 centimeters from line  $\ell$ .

Use this space for computations.



How many points are both 2 centimeters from line  $\ell$  and 1 centimeter from point  $P$ ?

- |       |       |
|-------|-------|
| (1) 1 | (3) 0 |
| (2) 2 | (4) 4 |

24 The ratio of two supplementary angles is 3:6. What is the measure of the *smaller* angle?

- |                |                |
|----------------|----------------|
| (1) $10^\circ$ | (3) $30^\circ$ |
| (2) $20^\circ$ | (4) $60^\circ$ |

25 Which point is on the circle whose equation is  $x^2 + y^2 = 289$ ?

- |                 |                 |
|-----------------|-----------------|
| (1) $(-12, 12)$ | (3) $(-1, -16)$ |
| (2) $(7, -10)$  | (4) $(8, -15)$  |

26 The Edison Lightbulb Company tests 5% of their daily production of light-bulbs. If 500 bulbs were tested on Tuesday, what was the total number of bulbs produced that day?

- |           |             |
|-----------|-------------|
| (1) 25    | (3) 10,000  |
| (2) 1,000 | (4) 100,000 |



Use this space for  
computations.

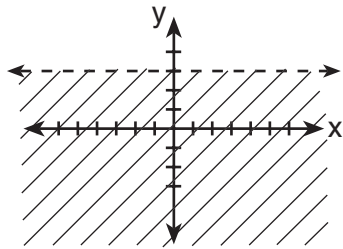
27 Which statement is expressed as a biconditional?

- (1) Two angles are congruent if they have the same measure.
- (2) If two angles are both right angles, then they are congruent.
- (3) Two angles are congruent if and only if they have the same measure.
- (4) If two angles are congruent, then they are both right angles.

28 A committee of five members is to be randomly selected from a group of nine freshmen and seven sophomores. Which expression represents the number of different committees of three freshmen and two sophomores that can be chosen?

- (1)  ${}_9C_3 + {}_7C_2$
- (2)  ${}_9C_3 \cdot {}_7C_2$
- (3)  ${}_{16}C_3 \cdot {}_{16}C_2$
- (4)  ${}_9P_3 \cdot {}_7P_2$

29 Which inequality is represented by the accompanying graph?



- (1)  $y < 3$
- (2)  $y > 3$
- (3)  $y \leq 3$
- (4)  $y \geq 3$

30 Which equation illustrates the multiplicative inverse property?

- (1)  $1 \cdot x = x$
  - (2)  $x \cdot \frac{1}{x} = 1$
  - (3)  $1 \cdot 0 = 0$
  - (4)  $-1 \cdot x = -x$
-

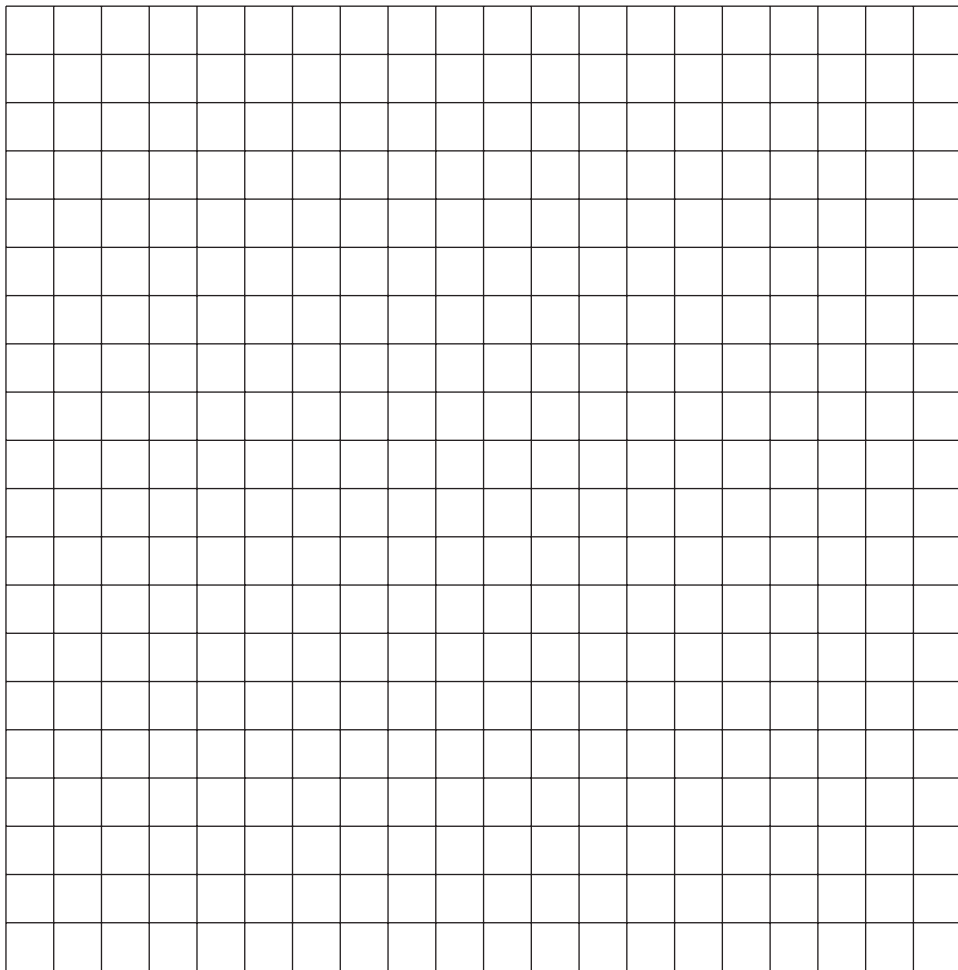
## Part II

Answer all questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [10]

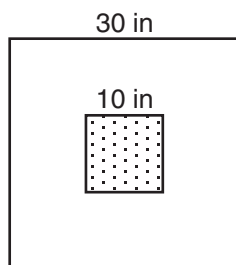
31 Simplify:  $\frac{x^2 + 6x + 5}{x^2 - 25}$

32 Write an irrational number and explain why it is irrational.

**33** In a circle whose center is  $(2,3)$ , one endpoint of a diameter is  $(-1,5)$ . Find the coordinates of the other endpoint of that diameter. [The use of the accompanying grid is optional.]



- 34 The accompanying diagram shows a square dartboard. The side of the dartboard measures 30 inches. The square shaded region at the center has a side that measures 10 inches. If darts thrown at the board are equally likely to land anywhere on the board, what is the theoretical probability that a dart does *not* land in the shaded region?



**35** A candy store sells 8-pound bags of mixed hazelnuts and cashews. If  $c$  pounds of cashews are in a bag, the price  $p$  of the bag can be found using the formula  $p = 2.59c + 1.72(8 - c)$ . If one bag is priced at \$18.11, how many pounds of cashews does it contain?

### Part III

Answer all questions in this part. Each correct answer will receive 3 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [6]

36 Solve for  $x$ :  $\frac{1}{16}x + \frac{1}{4} = \frac{1}{2}$

37 Solve for  $x$ :  $x^2 + 2x - 24 = 0$

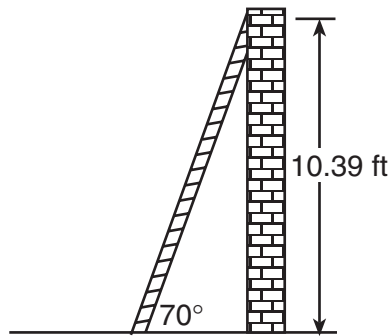
### Part IV

Answer all questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. [8]

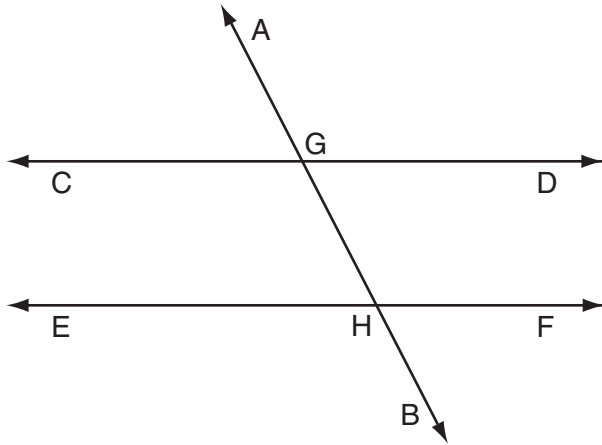
38 As shown in the accompanying diagram, a ladder is leaning against a vertical wall, making an angle of  $70^\circ$  with the ground and reaching a height of 10.39 feet on the wall.

Find, to the *nearest foot*, the length of the ladder.

Find, to the *nearest foot*, the distance from the base of the ladder to the wall.



39 In the accompanying diagram,  $\overleftrightarrow{CD} \parallel \overleftrightarrow{EF}$ ,  $\overleftrightarrow{AB}$  is a transversal,  $m\angle DGH = 2x$ , and  $m\angle FHB = 5x - 51$ . Find the measure, in degrees, of  $\angle BHE$ .

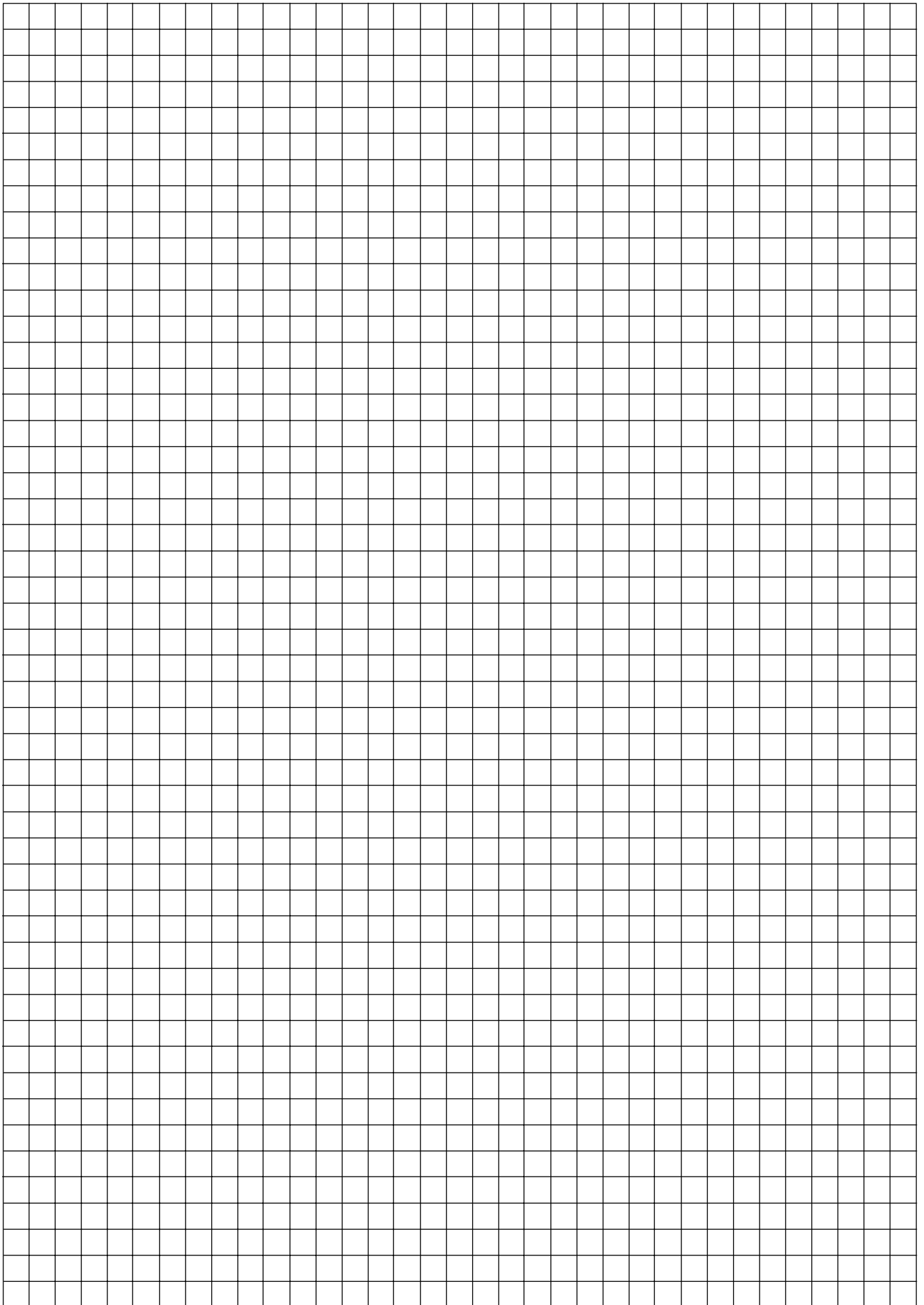




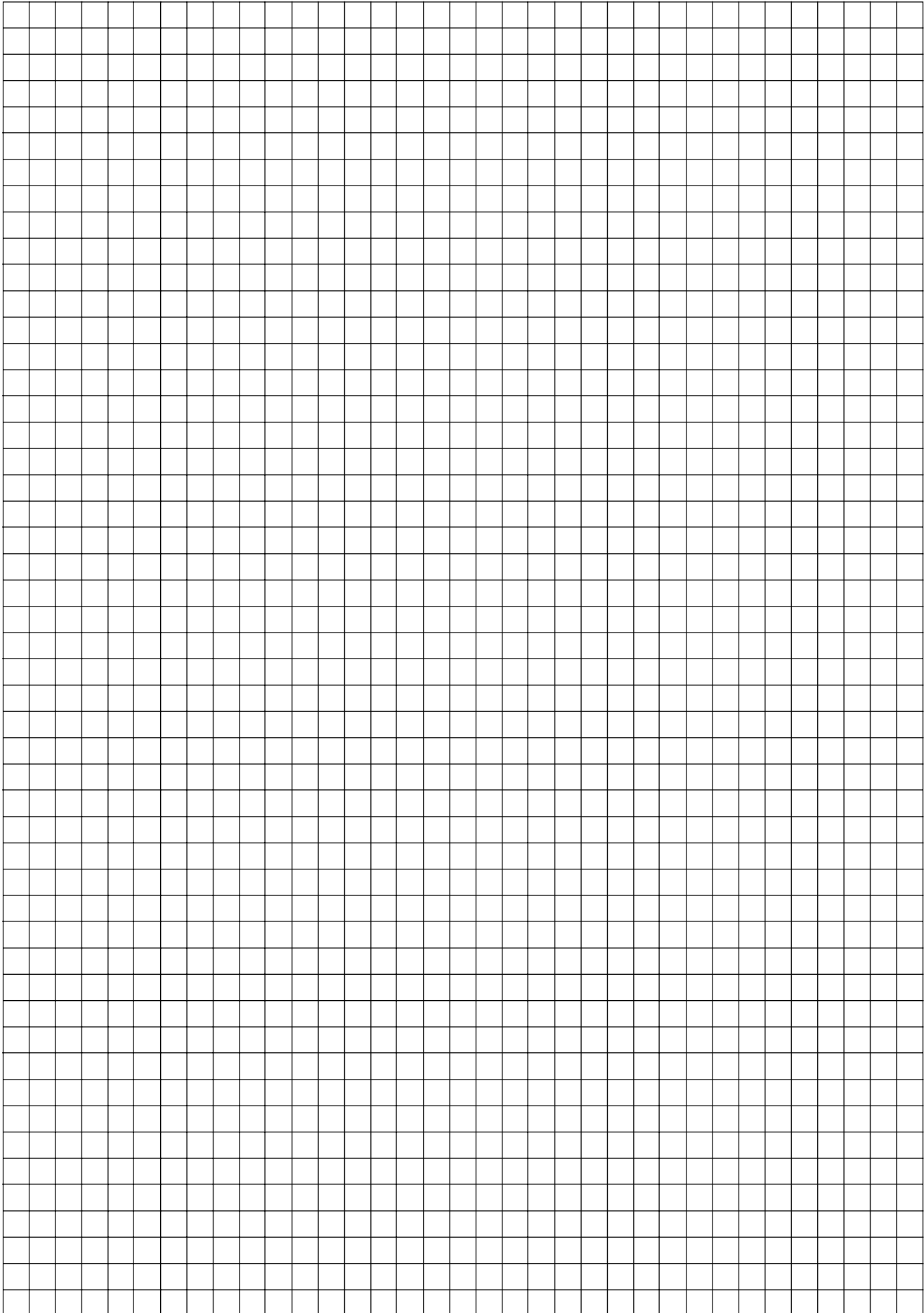
**Scrap Graph Paper — This sheet will *not* be scored.**

Tear Here

Tear Here



Scrap Graph Paper — This sheet will *not* be scored.



Tear Here

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

MATHEMATICS A

Thursday, January 26, 2006 — 1:15 to 4:15 p.m., only

ANSWER SHEET

Student ..... Sex:  Male  Female Grade .....

Teacher ..... School .....

Your answers to Part I should be recorded on this answer sheet.

Part I

Answer all 30 questions in this part.

- 1 ..... 9 ..... 17 ..... 25 .....
2 ..... 10 ..... 18 ..... 26 .....
3 ..... 11 ..... 19 ..... 27 .....
4 ..... 12 ..... 20 ..... 28 .....
5 ..... 13 ..... 21 ..... 29 .....
6 ..... 14 ..... 22 ..... 30 .....
7 ..... 15 ..... 23 .....
8 ..... 16 ..... 24 .....

Your answers for Parts II, III, and IV should be written in the test booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

Tear Here



# FOR TEACHERS ONLY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

## MATHEMATICS A

Thursday, January 26, 2006 — 1:15 to 4:15 p.m., only

### SCORING KEY

#### Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Mathematics A examination. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics A and Mathematics B*.

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* attempt to correct the student's work by making insertions or changes of any kind. Use checkmarks to indicate student errors.

Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. On the back of the student's detachable answer sheet, raters must enter their initials in the boxes next to the questions they have scored and also write their name in the box under the heading "Rater's/Scorer's Name."

Raters should record the student's scores for all questions and the total raw score on the student's detachable answer sheet. Then the student's total raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Thursday, January 26, 2006. The student's scaled score should be entered in the box provided on the student's detachable answer sheet. The scaled score is the student's final examination score.

#### Part I

Allow a total of 60 credits, 2 credits for each of the following. Allow credit if the student has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 3	(6) 3	(11) 2	(16) 4	(21) 2	(26) 3
(2) 3	(7) 1	(12) 2	(17) 1	(22) 4	(27) 3
(3) 4	(8) 4	(13) 1	(18) 3	(23) 1	(28) 2
(4) 2	(9) 1	(14) 4	(19) 1	(24) 4	(29) 1
(5) 4	(10) 1	(15) 3	(20) 2	(25) 4	(30) 2

Updated information regarding the rating of this examination may be posted on the New York State Education Department’s web site during the rating period. Visit the site <http://www.emsc.nysed.gov/osa/> and select the link “Latest Information” for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

### **General Rules for Applying Mathematics Rubrics**

#### **I. General Principles for Rating**

The rubrics for the constructed-response questions on the Regents Examinations in Mathematics A and Mathematics B are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher’s professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examinations in Mathematics A and Mathematics B*, use their own professional judgment, confer with other mathematics teachers, and/or contact the consultants at the State Education Department for guidance. During each Regents examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

#### **II. Full-Credit Responses**

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase “such as”), it does **not** mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

#### **III. Appropriate Work**

*Full-Credit Responses:* The directions in the examination booklet for all the constructed-response questions state: “Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, charts, etc.” The student has the responsibility of providing the correct answer **and** showing how that answer was obtained. The student must “construct” the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

*Responses With Errors:* Rubrics that state “Appropriate work is shown, but ...” are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete, i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has **not** been shown. Other rubrics address incomplete responses.

#### **IV. Multiple Errors**

*Computational Errors, Graphing Errors, and Rounding Errors:* Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in any response. The teacher must carefully review the student’s work to determine what errors were made and what type of errors they were.

*Conceptual Errors:* A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents. A response with one conceptual error can receive no more than half credit.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

If a response shows two (or more) different major conceptual errors, it should be considered completely incorrect and receive no credit.

If a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors: i.e., awarding half credit for the conceptual error and deducting 1 credit for each mechanical error (maximum of two deductions for mechanical errors).

**Part II**

For each question, use the specific criteria to award a maximum of two credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

- (31) [2]  $\frac{x + 1}{x - 5}$ , and appropriate work is shown.
- [1] Only one expression is factored correctly, such as  $(x + 5)(x + 1)$  or  $(x + 5)(x - 5)$ , but an appropriate simplification is done.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (32) [2] An irrational number is written, and an appropriate explanation is written, such as an irrational number cannot be written as a fraction or as a repeating or terminating decimal.
- [1] An irrational number is written, such as  $\pi$  or the square root of a nonperfect square, but no explanation or an inappropriate explanation is written.
- or*
- [1] A correct definition of an irrational number is written, but the example is missing or is inappropriate.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS A – *continued*

- (33) [2] (5,1), and appropriate work is shown, such as a graph using the slope or  $2 = \frac{x-1}{2}$  and  $3 = \frac{y+5}{2}$ .

[1] Both (2,3) and (-1,5) are plotted correctly, but one graphing error is made in finding the other endpoint.

**or**

[1] Appropriate work is shown, but one conceptual error is made.

**or**

[1] Appropriate work is shown, but only  $x = 5$  or  $y = 1$  is found.

**or**

[1] Appropriate work is shown, and the correct endpoint is designated, but the coordinates are not stated.

**or**

[1] (5,1), but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

- (34) [2]  $\frac{800}{900}$  or an equivalent answer, and appropriate work is shown, such as finding the areas of the two squares, subtracting the area of the smaller square from the area of the larger square, and setting up a correct ratio.

[1] Appropriate work is shown, but one computational error is made.

**or**

[1] Appropriate work is shown, but one conceptual error is made, such as calculating the perimeters of the squares instead of the areas.

**or**

[1] Appropriate work is shown, but  $\frac{100}{900}$  or an equivalent answer (the complement of the correct answer) is found.

**or**

[1] The areas of the squares are calculated incorrectly, but an appropriate probability is found.

**or**

[1]  $\frac{800}{900}$  or an equivalent answer, but no work is shown.

[0] The areas of the squares are calculated correctly, but no probability is stated.

**or**

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.



MATHEMATICS A – *continued*

(35) [2] 5, and appropriate work is shown, such as substituting \$18.11 for  $p$  and solving the equation correctly, or trial and error with at least three trials and appropriate checks.

[1] Appropriate work is shown, but one computational error is made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] 5, but no work or fewer than three trials with appropriate checks are shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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**Part III**

For each question, use the specific criteria to award a maximum of three credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(36) [3] 4, and appropriate work is shown.

[2] Appropriate work is shown, but one computational error is made.

[1] Appropriate work is shown, but two or more computational errors are made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] 4, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS A – *continued*

(37) [3]  $-6$  and  $4$ , and appropriate work is shown, such as factoring or trial and error with at least three trials and appropriate checks.

[2] Appropriate work is shown, but one computational error is made.

*or*

[2] Appropriate work is shown, but only one correct value for  $x$  is found.

*or*

[2] The trial-and-error method is used to find the correct solutions, but only two trials and appropriate checks are shown.

[1] Appropriate work is shown, but two or more computational errors are made.

*or*

[1] Appropriate work is shown, but one conceptual error is made.

*or*

[1] The equation is factored correctly, but no values are found.

*or*

[1] The equation is factored incorrectly, but two appropriate values are found.

*or*

[1]  $-6$  and  $4$ , but no work or only one trial with an appropriate check is shown.

[0]  $-6$  or  $4$ , but no work or only one trial with an appropriate check is shown.

*or*

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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**Part IV**

For each question, use the specific criteria to award a maximum of four credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(38) [4] Length of ladder = 11 and distance from the base of the ladder to the wall = 4, and appropriate work is shown, such as using sine and then tangent or the Pythagorean theorem.

[3] Appropriate work is shown, but one computational or rounding error is made.

*or*

[3] Appropriate work is shown, but the correct answers are not labeled or are labeled incorrectly.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

*or*

[2] Appropriate work is shown, but one conceptual error is made, such as using one incorrect trigonometric ratio.

*or*

[2] Appropriate work is shown, but only the length of the ladder or the distance from the base of the ladder to the wall is found.

*or*

[2] Two correct trigonometric equations are written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

*or*

[1] Only one correct trigonometric equation is written, and no further correct work is shown.

*or*

[1] Length of ladder = 11 and distance from the base of the ladder to the wall = 4, but no work is shown.

[0] Length of ladder = 11 *or* distance from the base of the ladder to the wall = 4, but no work is shown.

*or*

[0] 11 and 4, but no work is shown, and the solutions are not labeled.

*or*

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

MATHEMATICS A – *continued*

(39) [4] 146, and appropriate work is shown, such as solving the equation  $2x = 5x - 51$ .

[3] Appropriate work is shown, but one computational error is made.

*or*

[3] The measure of  $\angle FHB$  or  $\angle DGH$  is found to be 34, and appropriate work is shown, but no further correct work is shown.

[2] Appropriate work is shown, but two or more computational errors are made.

*or*

[2] Appropriate work is shown, but one conceptual error is made, such as solving the equation  $2x + 5x - 51 = 180$ .

*or*

[2] The correct equation is solved for  $x = 17$ , but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

*or*

[1] The correct equation is written, but no further correct work is shown.

*or*

[1] 146, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

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**Map to Learning Standards**

<b>Key Ideas</b>	<b>Item Numbers</b>
Mathematical Reasoning	16, 21, 27
Number and Numeration	7, 30, 32
Operations	2, 3, 8, 9, 19, 22, 31
Modeling/Multiple Representation	4, 10, 13, 14, 20, 23, 24, 39
Measurement	5, 11, 15, 17, 18, 26, 33, 38
Uncertainty	12, 28, 34
Patterns/Functions	1, 6, 25, 29, 35, 36, 37

**Regents Examination in Mathematics A**

**January 2006**

**Chart for Converting Total Test Raw Scores to  
Final Examination Scores (Scaled Scores)**

**The *Chart for Determining the Final Examination Score for the January 2006 Regents Examination in Mathematics A* will be posted on the Department’s web site <http://www.emsc.nysed.gov/osa/> on Thursday, January 26, 2006. Conversion charts provided for previous administrations of the Mathematics A examination must NOT be used to determine students’ final scores for this administration.**



